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SCIENCE TRENDS

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Nuclear Applications

Outlook for successful application of nuclear energy in aircraft and spacecraft brightened perceptibly in Washington during the past week. Progress on the Pluto nuclear ramjet program was cited as particularly promising. Aircraft Nuclear Propulsion project received fresh support. New aspects of the SNAP program are revealed.

*Project Pluto: AEC Chairman John McCone says scientists working on this nuclear powered ramjet for missile or reconnaissance purposes are now "sure of success" despite some unanswered technical problems. They have provided him with a forecast as to when the demonstration unit will be ready for land tests and operational use.

*Project Rover: First ground tests confirm theories which predicted high specific impulse from nuclear energy in rocket propulsion. McCone states the importance of bringing Rover to operational readiness as quickly as possible if placing large and heavy payloads into orbit is important to the space program.

*Aircraft Nuclear Propulsion: New support for the general principles of this troubled program came during the week from McCone, AEC Commissioner John F. Floberg, and others. However, the Chairman warns that a decision must be made soon to concentrate on either the General Electric Co. or the Pratt and Whitney approach to the reactor system. Indications are that this decision will be prompted mainly by budgetary policy and will apparently delay nuclear flight for several more years.

*SNAP 8: National Aeronautics and Space Administration has decided to go ahead with development of an advanced nuclear turbo-electric system for space auxiliary power and propulsion. Proposals from industry were solicited Oct. 30, and are due Dec. 11 with a contract award for conversion unit and system management expected early next year. Reactor development is being handled through the AEC. Preliminary studies by NASA indicate such a power source should weigh about 2,000 pounds with an output of 30 KW of electric power, or about 3,000 pounds with an output of 60 KW.

*SNAP 2: A 220 pound reactor from Atomics International has been successfully operated at full power and maximum temperature. This SNAP 2 unit is designed to provide several kilowatts of power for a year or more when used with a compact turbo-electric generator from Thompson-Ramo-Wooldridge, Inc. AEC has spent about $6.5 million on this project,which is in effect a miniature nuclear power plant.

* AEC "Influence" Regulations

Tight new regulations issued by the Atomic Energy Commission are designed to reduce possible influence-peddling scandals which have affected other Government regulatory agencies from time to time.

It is now a published rule that representatives of private industry may not write to or speak to Commissioners or their advisors concerning "substantive matters" involving so-called quasi-judicial functions. If the AEC official cannot avoid such contact the entire incident must become a matter of public record.

This rule, the Commission states, would not inhibit normal social, business, or professional relations...so long as substantive matters affecting a pending proceeding were not discussed.

(Text of the new regulations is available upon request from Information Office, U.S. Atomic Energy Commission, Washington 25, D.C. Ask for Announcement No. B-219)

* Space Secrecy

National Aeronautics and Space Administration is apparently reversing its policy of keeping secret its schedule for more spectacular launchings such as the sodium vapor cloud experiments and inflatable balbon experiments. Two Congressional Committees began looking into this policy following editorial complaints. (SCIENCE TRENDS, Nov. 2, 1959)

* A Space Race?

Dr. Keith Glennan, Administrator, NASA, was asked at a National Press Club appearance during the past week for his comments on suggestions that President Eisenhower should admit publicly that the U.S. is engaged in a "space race."

Dr. Glennan's reply: "That's a provocative question."

* Chemical Safety Poll

The Federal Food and Drug Administration is publishing a new list of 182 chemicals "found safe for use in foods" when used in accordance with good manufacturing processes.

The safety decision was based largely upon a poll which almost two out of three recipients declined to answer; only 355 out of 900 "experts" responded.

All the chemicals asserted to be safe were included in a proposed list of 188 substances offered for consideration last December. Six chemicals are being kept off the list pending further consideration -- carbon black, charcoal, titanium dioxide and ultramarine blue for coloring and oleic acid and linoleic acid.

(Complete list available shortly. Single copies free. Write Information Office, Food and Drug Administration, Washington 25, D.C.)

FAA Research and Development

Here is a progress report on some major research and development activities of the Federal Aviation Agency, as seen by Deputy Administrator, James T. Pyle:

*Guidance and Control: First component deliveries are scheduled for January, 1960 in the REGAL guidance system designed to govern Range, Elevation, Guidance, Approach and Landing of modern high-speed aircraft. In this system, an airborne receiver uses a narrow, ground-based scanning beam to determine how far and how high a plane is from touchdown.

An airborne computer will take REGAL's altitude and distance data, analyze it and transform it into commands to the autopilot. In the absence of an autopilot the computer will provide displays for pilot control.

Plans call for ground-testing of guidance elements by early 1960 with a flight test in mid-1960. If preliminary experiments prove successful FAA will buy and put to work a complete engineering model. System is expected to be ready for operation in five years.

*Data Processing Central: First delivery is expected next month on this fully transistorized digital computer system which features a high-speed core memory and file drum unit. System is designed to handle all repetitive, non-decision-making functions for the air traffic controller. Features include safety circuitry, dual storage drums, capability of re-routing messages and error-checking.

Operation: System is designed to accept and remember pending flight plans, activating them at the proper time, clearing them and distributing flight progress strips. It is expected to provide automatic and semi-automatic tracking facilities for each aircraft under radar control, along with correlated identification of these aircraft.

For incoming traffic, Data Processing Central will be used to calculate expected times of arrival, and assist in setting up an optimum landing sequence for each runway under control. In addition, displays will permit controllers to re-enter missed approaches and the approaches of any unanticipated aircraft in the area.

Collision warning will be a major function. System is expected to be capable of warning of "any unsafe situation" such as insufficient separation or potential collision course -- and will automatically suggest corrective alternatives as much as 30 minutes in advance.

Installation: System is designed in a building block configuration to handle traffic graduated in complexity and density. Plans call for use in controlling New York City area traffic in 1963, with subsequent deliveries in Chicago, Los Angeles, Washington and Miami.

*Aircraft Noise: Pyle indicates an expanded effort aimed at reduction or suppression of jet turbine noise. Despite the expenditure of vast sums, he reports, a hoped-for breakthrough has not been achieved. "We must," Pyle declares, "invent our way out of this noise difficulty."

Army Aviation Requirements

Army Transportation Corps will brief approximately 100 aircraft and electronic firms at Fort Monroe, Va., Dec. 1 on long-range needs in aviation. Officials hope the meeting will stimulate industry thinking and eventually lead to one or more prototypes.

Requirements: Army Transportation foresees three areas in which new types of aircraft not now available, may be needed over the next 10 to 12 years. These are:

* Light observation aircraft with a wide array of performance capabilities close to the battlefield.

* Surveillance aircraft heavily instrumented with electronic detection devices.

* Versatile, highly-mobile transport aircraft built to operate in battle areas.

Characteristics: Army emphasizes that there are no rigid requirements or characteristics established. Industry will be given a wide latitude in applying its thinking to the general range of problems. Radically new ideas -- if necessary -- will be sought.

Firms will be given approximately 10 weeks to work out on a voluntary, no-pay basis, suggested design concepts. These will be evaluated by the Army and will be used in drafting specific military and technical characteristics on which later design competition may be based.

Army hopes that research, development, testing, and production on at least one vehicle -- and possibly more -- can be started with money available in the 1960 - 1961 period.

(Firms which have not received invitations but are interested in attending, contact Transportation Research Command, Research Contracting Officer, Ft. Eustis, Va., or call TRinity 7-1311, Ext. 21178.)

Cold Regions Research

Army will spend about $3,250,000 for a new Cold Regions Research Laboratory near the campus of Dartmouth College, Hanover, N.H.

New Laboratory will combine the present Snow, Ice and Permafrost Research Establishment at Wilmette, Ill., and the Arctic Construction and Frost Effects Laboratory at Waltham, Mass.

New FAA Wind Tunnel

Federal Aviation Administration is installing an induction-type aircraft wind tunnel at its National Aviation Facilities Experimental Center, Atlantic City, N.J.

Tunnel was obtained from the Navy Pacific Missile Range Headquarters under an inter-agency agreement and will be used by FAA's Bureau of Research and Development for experiments and tests on in-flight fire protection in aircraft, simulating speeds up to 600 miles per hour.

Research Checklist

( ) High Temperature Measurements: A platinum resistance thermometer for use at temperatures above 630° C has been developed at the National Bureau of Standards. Researchers expect the instrument to provide superior precision and reproducibility than is possible with present techniques. High temperature stability was demonstrated in tests of 100 hours at 1000°C. Mechanical shock tests have demonstrated success of a design in which four equally-spaced synthetic sapphires support the resistor wire.

(Further Details available. Free. Write Office of Technical Information, National Bureau of Standards, Washington 25, D.C. for Summary Technical Report - High Temperature Resistance Thermometry)

( ) Rocket Motor Inspection: Reduced inspection time and costs are expected to result from the use of high-voltage x-rays from a betatron or linear accelerator for inspection of large-diameter solid propellant rocket motors such as the Polaris ICBM motor. Detection of harmful cracks beyond five degrees from the axis of an x-ray beam has previously been difficult to achieve. However, experiments indicate that higher energies now available make rapid and accurate inspection possible over a wider area.

(R&D by Naval Ordnance Laboratory, White Oak, Md. and Picatinny Arsenal, Dover, New Jersey)

( ) Aircraft Roller Bearings: Certain available aircraft roller bearings and lubricants can provide reasonable lives in airframe applications up to 600°F. according to a study by Battelle Memorial Institute for the Air Force. More than 1,000 commercially available bearings were evaluated in the program and various load-life charts were established.

(Report available. 104 pages. $2.50. Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 909)

( ) Electric Field Transducers: Studies by the Navy indicate that a hollow piezoceramic sphere transducer shows great promise as a high-power deep-submergence sonar transmitter for underwater detection programs. In recent tests a thick-shell sphere, electroded completely on both inside and outside surfaces and polarized radially, was used as a source and receiver of underwater sound.

(Report to be published in the near future as NRL Report 5405, by U.S. Naval Research Laboratory, Sound Division, Washington 25, D.C.)

( ) Point-Source Gamma Ray Standards: Point-source gamma-ray emitters are being made available for the first time by the National Bureau of Standards for use in approximating "ideal" conditions when calibrating scintillation counters and other beam-detecting devices. Now available are sodium-22, zinc-65, niobium-95, strontium-85, and mercury-203. Each standard consists of radioactive material deposited between two layers of a thin polyester tape.

(Standards available for purchase from Radioactivity Section, National Bureau of Standards, Washington 25, D.C.)

Publication Checklist

( ) World Mineral Production, a comprehensive statistical report giving country-by-country production figures for minerals in 1958. Report covers 63 commodities including metals and metallic ores, nonmetallic materials, and fuels such as coal and petroleum. Single copies free. (Write Publications-Distribution Section, U.S. Department of the Interior, U.S. Bureau of Mines, Washington 25, D.C. for MMS 2979)

( ) Antennas and Radio Propagation, a newly reprinted study of antennas and wave propagation prepared for the U.S. Army. Discusses the electromagnetic wave, wave propagation, modes of propagation, half-wave and quarter-wave antennas, long-wire antennas, driven and parasitic arrays and radio direction finding antennas. 225 pages. $1.25. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. D 101.11:11-666)

( ) Research and Development Studies, an annotated survey of current projects throughout the U.S. dealing with the Economic and Other Impacts of Scientific Research and Development. All listed projects are being carried out in colleges and universities. 55 pages. Single copies free. (Write Information Office, National Science Foundation, Washington 25, D.C. for NSF 59-51)

( ) Cerous Fluoride Research: A report which presents results of low-temperature heat capacity and high temperature heat-content measurements for cerous fluoride, one of the most intermediate compounds in the production of cerium metal. The study is said to supply the first such published data for a rare-earth fluoride. 7 pages. Single copies free. (Write Publications-Distribution Section, U.S. Department of the Interior, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa., for Report of Investigation No. 5510)

( ) Aerospace Terminology, a loose-leaf pamphlet designed to enable all Air Force members to "speak the same language" when discussing missiles, spacecraft, aircraft, satellites and related matters. The pamphlet also lists many aerospace vehicles and projects of the Department of Defense and the National Aeronautics and Space Administration. Single copies free. (Write Industrial Branch, (SAFOI-2), Department of the Air Force, Washington 25, D.C. for Air Force Pamphlet 11-1-4 - "Interim Aerospace Terminology Reference)

( ) Defense Contracting, revised cost principles for use in defense contracting in research and development, production and many fields. 35 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Revision No. 50, Armed Services Procurement Regulations.

( ) All-Weather Flight Manual, a newly reprinted manual issued by the Office of Chief of Naval Operations containing a variety of information relating to the basic instruments in aircraft, all-weather flight operations and aerology. 595 pages. $3.50 (Write Service Department, Washington Science Trends, 1120 National Press Building, Washington 4, D.C.)